

# Assessment of Pulp Stones in Canines and Posterior Teeth of Permanent Dentition: An Orthopantomographic Study

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## ABSTRACT

**Introduction:** Pulp stones are discrete foci of calcification in the pulp, radiographically identified as a radiopaque mass within the pulp chamber or root canal. They may obstruct pulp chambers and root canals during biomechanical preparation of root canal treatment.

**Objective:** To study the prevalence of pulp stones in canines and posterior teeth of permanent dentition.

**Materials and Method:** It was an observational, analytical, cross-sectional study using convenient sampling. Digital orthopantomograms (OPG) of 420 calculated samples of age range 15-44 years were collected from two centres of Kathmandu. The selected OPGs were evaluated for the presence of pulp stone under standard screen resolution. The association between the occurrence of pulp stones with gender, age group, and tooth type was evaluated using Chi-square test ( $P < 0.001$ ) and analysed using SPSS software version 20.

**Result:** Among the total sample, 293 (69.76%) showed the presence of pulp stones on at least one site. The occurrence of pulp stones was more common in females 169 (80.47%) as compared to males 124 (59.04%). It was more prevalent in maxillary left first molar 183 (43.6%), followed by maxillary right first molar 176 (41.9%), and least common in maxillary right and left second premolars.

**Conclusion:** Pulp stones were more evident in female samples. The prevalence of pulp stones was highest in the age group of 35-44 years. It was significantly higher in molars than in canines and premolars. There was a significant association between the prevalence of pulp stones and gender, age group, and tooth type.

**Keywords:** Panoramic; prevalence; pulp stone; root canal treatment.

## INTRODUCTION

Pulp stones are calcified masses found in the pulp tissue in free or attached to the dentine.<sup>1</sup> They can be classified as true or false pulp stones structurally and as embedded, adherent, and free, based on the location.<sup>2</sup> The cause of the formation of pulp stones is still unknown. They might be associated with ageing, caries, orthodontic tooth movement, poor circulatory supply, periodontal disease, idiopathic, genetic factors, etc.<sup>3</sup>

Different forms of radiographs such as intraoral periapical radiograph, bitewing, and orthopantomogram (OPG) can be used to identify

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them. They may occur as a single dense mass or as several small opacities within the pulp cavity or root canal.<sup>4</sup> They may narrow or even obstruct access to the apical part of the root canal which can hinder the canal negotiation, biomechanical cleaning and shaping, and ultimately lead to failure of root canal treatment.<sup>5</sup>

Fewer studies have been done previously on pulp stones in the Nepali population.<sup>6,7</sup> These information help to anticipate the difficulties that might occur during endodontic treatment. The present study aims to describe the prevalence of pulp stones in the adult Nepali sample and their occurrence according to gender, age group, and tooth type.

## MATERIALS AND METHOD

This analytical cross-sectional study consisted of 420 digital panoramic radiographs of subjects aged 15 to 44 years with equal distribution of males and females. The OPGs were obtained from the archives of two radiological centres; namely Department of Oral Medicine and Radiology, Kantipur Dental College, Basundhara, Kathmandu and Dental Radiology Centre, Jamal, Kathmandu, Nepal. Ethical approval was obtained from the Institutional Review Committee, Kantipur Dental College (Ref. 36/021). The study was carried out during April-June 2021.

A proforma sheet was developed to record the data. The OPGs with the presence of all canines, posterior teeth except third molars were studied. The subjects were categorised into the age group of 15-24, 25-34, and 35-44 years. Radiographic records with poor quality images, subjects with an evidence of trauma or jaw fracture, grossly destructed teeth, and previous orthodontic treatment were excluded. The sampling was done using convenient sampling technique. The sample size was calculated based on the prevalence of pulp stone in the formula  $n = z^2pq/e^2$ ; where  $z = 1.96$  at 95% confidence interval;  $p = 0.4105$  (41.05% prevalence);<sup>6</sup>  $q = 1-p$ ;  $e = 0.05$  (5%).

The radiographs were examined by two examiners in standardised screen brightness, magnification, and resolution. The findings were reported in consensus among the investigators. Canines and posterior teeth with a definitive radiopaque mass were recorded as having a pulp stone. The data were entered in Microsoft Excel sheet and were analysed using the IBM Statistical Package for Social Sciences (SPSS) Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). Data were analysed comparing male and female groups. The association between the occurrence of pulp stone with gender, age group, and tooth type was evaluated using the Chi-square test. The level of significance was set at  $P < 0.001$ .

## RESULT

The mean age of subjects in the age group 15-24 years was  $19.91 \pm 2.72$  years, mean age of age group 25-34 years was  $29.38 \pm 3.09$  years, and that of 35-44 years was  $39.02 \pm 2.81$  years. Out of the total 420 subjects, 293 (69.76%) individuals showed the presence of at least one pulp stone. One hundred and twenty seven (30.24%) subjects did not exhibit the presence of pulp stone. Among all, 169 (80.47%) female and 124 (59.04%) male subjects had pulp stones (Table 1). There was a statistically significant association between the prevalence of pulp stone and gender.

Prevalence of pulp stone was more in the age group 35-44 years and least in the subjects belonging to the age group 25-34 years (Table 2). There was no significant association between the prevalence of pulp stone and age group.

Pulp stones were more prevalent in the maxillary left first molar (183, 43.6%), followed by maxillary right first molar (176, 41.9%), and were least commonly observed in maxillary right and left second premolars (Table 3). There was a significant association between the occurrence of pulp stone and tooth type except for maxillary right

**Table 1: Distribution and association of pulp stone according to gender, n (%).**

Sample	Male	Female	Total	P value
Subject with pulp stone	169 (80.47)	124 (59.04)	293 (69.76)	<0.001
Subject without pulp stone	41 (19.53)	86 (40.96)	127 (30.24)	
Total	210	210	420	

**Table 2: Distribution and association of pulp stone according to age group, n (%).**

Age group (in years)	Pulp stones absent	Pulp stones present	P value
15-24	38 (27.14)	102 (72.86)	0.004
25-34	56 (40.58)	82 (59.42)	
35-44	33 (23.24)	109 (76.76)	
<b>Total</b>	127 (30.24)	293 (69.76)	

**Table 3: Distribution and association of pulp stone according to tooth type, n (%).**

Tooth type (FDI system)	Pulp stone absent	Pulp stone present	P value	
Maxillary	13	391 (93.10)	29 (6.90)	<0.001
	14	417 (99.30)	3 (0.7)	0.557
	15	418 (99.50)	2 (0.50)	0.351
	16	244 (58.10)	176 (41.90)	<0.001
	17	295 (70.20)	125 (29.80)	<0.001
	23	396 (94.30)	24 (5.70)	<0.001
	24	413 (98.30)	7 (1.70)	0.107
	25	418 (99.50)	2 (0.50)	1.0
	26	237 (56.40)	183 (43.60)	<0.001
	27	303 (72.10)	117 (27.90)	<0.001
Mandibular	33	398 (94.80)	24 (5.70)	<0.001
	34	396 (94.30)	24 (5.70)	<0.001
	35	404 (96.20)	16 (3.80)	0.004
	36	295 (70.20)	125 (29.80)	<0.001
	37	357 (85.00)	63 (15.00)	<0.001
	43	398 (94.80)	22 (5.20)	<0.001
	44	397 (94.50)	23 (5.50)	<0.001
	45	410 (97.60)	10 (2.40)	0.036
	46	310 (73.80)	110 (26.20)	<0.001
	47	354 (84.30)	66 (15.70)	<0.001

first premolar, maxillary right second premolar, maxillary left first premolar, maxillary left second premolar, mandibular right second premolar and mandibular left second premolar.

## DISCUSSION

Pulp stones are not clinically apparent but are common incidental radiographic findings. Orthopantomogram can display the entire teeth in a single frame; however, it does not provide a clear image of anterior teeth. Therefore, anterior were not included in this study. Radiographically, pulp stones are identified as a single dense radiopaque mass occluding the pulp cavity or as several small opacities within the pulp chambers or in the root canal. They can be round to oval and they are sized

up to 2-3 mm in diameter.<sup>4</sup> They are reported more often in coronal pulp than the radicular pulp, caused mainly due to the aberrant developmental process or symptoms of changes in the pulp tissue. They are often asymptomatic and do not require treatment.<sup>8</sup>

In the present study, pulp stones were prevalent in 293 (69.76%) cases which is similar to the studies conducted in Turkish population by Çolak et al. (63.6%),<sup>3</sup> Sisman et al. (57.6%).<sup>9</sup> This finding is higher compared to the study conducted by Acharya et al.<sup>6</sup> in Nepali samples with a prevalence of 41.05%, and of Yousuf et al. in South Indian population (14.4%).<sup>1</sup> The higher prevalence rate in the current study could be due to the inclusion of canines and premolars as well as due to the inclusion of a wider range of age groups.

This study revealed that the prevalence of pulp stone was more common in female subjects (169, 80.4%) as compared to males (124, 59.04%). This result shows similarities to the studies conducted by Acharya et al.<sup>6</sup> on Nepali and by Satheeshkumar et al. on South Indian population.<sup>10</sup>

In this study, pulp stone was more common in the subjects belonging to age group of 35-44 years. In the study conducted by Turkal et al.<sup>4</sup> pulp stone was more common in the 30-39 years group. Another study conducted by Bains et al.<sup>11</sup> showed that, pulp stones were present in 47.1% in the age group of 38-47 years.

Pulp stones were more common in molars, followed by canines and premolars. This finding is similar to that of the study conducted by Yousuf et al.,<sup>1</sup> Sisman et al.<sup>9</sup> which showed that pulp stones were more common in molars and seldom present in premolars. The prevalence of pulp stones in canines in the present study is far less (5.9%) as compared to the report by Hsieh et al. (34.7%).<sup>12</sup>

Out of 8400 teeth examined, 105 teeth presenting pulp stone also showed other findings. Among them, restoration was present in 58 teeth, caries was present in 31 teeth, impacted third molar impinged 15 teeth, and odontome was associated with one

tooth. However, these findings were not statistically significant to associate the presence of pulp stones with such factors.

This study did not evaluate the size, shape, and number of pulp stones. Hence, further detailed study is recommended involving such parameters.

## CONCLUSION

The prevalence of pulp stone is common in females as compared to males in a Nepali sample. The prevalence was highest in molars in the age group of 35-44 years followed by 15-24 years. The occurrence of pulp stone is associated with gender, age group, and tooth type; however, it could not be associated with any causative factor.

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**Conflict of interest:** None.



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